Phenotypic diversity of cyanide content and distribution in cassava plants, in association with carotenoids and protein content

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Cassava leaves, usually considered a byproduct of the production of cassava roots, may offer a significant source of proteins, essential amino-acids and vitamins, with nutritional benefits for both human and animal consumption. A concern however is the risk of cyanide formation from cyanogenic glycosides, if leaves are insufficiently processed. 178 cassava genotypes (Manihot esculenta Cranzt) from the genetic diversity collection of CIAT (Cali, Colombia) were grown and harvested to assess the diversity of cyanide contents in cassava leaves and roots, and characterize their nutritional potential (carotens, proteins, essential amino-acids). The cyanide concentration in leaves was determined at three different physiological ages. The contents of cyanide and all-trans-β-carotene in cassava leaves ranged from 345 ppm to 7484 ppm DB and from 171 µg/g to 547 µg/g DB, respectively. Cassava leaves also showed significant levels of essential amino-acids valine, leucine, phenylalanine, and lysine, and average total protein content of 11% DB. Analysis of the data by seven diversity groups corresponding to the centers of domestication of the genus Manihot in Latin America put in evidence significant differences in terms of cyanide contents in leaves, peels and parenchyma. In particular the Amazon and Andean groups were associated with high cyanide and low cyanide contents, respectively.